CLAIMS

What is claimed is:

1. A method, in a wireless receiver, for estimating a delay parameter associated with a received signal, the method comprising:

providing a signal sample corresponding to the received signal;

processing the signal sample to suppress on channel interference and provide a processed sample; and

determining the delay parameter by comparing the processed sample to a predetermined sample.

2. The method of claim 1 wherein the processing the signal sample to suppress the on channel interference further relies on known properties of the received signal.

3. The method of claim 1 wherein the processing the signal sample to suppress the on channel interference relies on a known quadrature phase relationship for a predesignated set of symbols in a portion of the received signal.

4. The method of claim 1 wherein the processing the signal sample and determining the delay parameter further comprises:

establishing a hypothetical delay for the signal sample based on an estimated delay for the received signal;

processing the received signal to provide a received signal estimate using the hypothetical delay, the signal sample, and the predetermined sample; and

comparing the received signal estimate to the predetermined sample to generate a difference value; and

choosing the delay parameter based on the difference value corresponding to the hypothetical delay.

5. The method of claim 4 wherein:

the establishing a hypothetical delay for the signal sample further comprises establishing a set of N_d hypothetical delays for the signal sample;

the processing the received signal to provide the received signal estimate further comprises:

extracting N_d portions of the signal sample, one portion corresponding to each of the N_d hypothetical delays; and

a corresponding signal estimate for each of the N_d hypothetical delays, using the N_d portions and the predetermined sample to provide N_d corresponding signal estimates;

the comparing the received signal estimate further comprises comparing each the N_d corresponding signal estimates to the predetermined sample to generate N_d difference values; and

the choosing the delay parameter further comprises choosing the hypothetical delay as the delay parameter for the received signal that corresponds to the smallest difference value.

6. The method of claim 4 wherein

the establishing a hypothetical delay for the signal sample further comprises establishing a set of N_d hypothetical delays for the signal sample;

the processing the received signal to provide the received signal estimate further comprises:

extracting a portion of the signal sample corresponding to one of the N_d hypothetical delays and N_d portions of the predetermined sample, one portion corresponding to each of the N_d hypothetical delays; and

determining a corresponding signal estimate for each of the N_d hypothetical delays, using the N_d portions and the portion of the signal sample to provide N_d corresponding signal estimates;

the comparing the received signal estimate further comprises comparing each of the N_d corresponding signal estimates to the corresponding one of the N_d portions of the predetermined sample to generate N_d difference values; and

the choosing the delay parameter further comprises choosing the hypothetical delay as the delay parameter for the received signal that corresponds to the smallest difference value.

7. The method according to claim 4, wherein:

the providing the signal sample corresponding to the received signal further comprises generating N_s polyphase signal samples associated with the received signal by decimating the received signal by N_s;

the establishing the hypothetical delay further includes establishing the hypothetical delay value for each of the N_s polyphase signal samples based on the estimated position of the predetermined sample within the received signal; and the processing and the comparing are repeated for each of the N_s polyphase signal samples to provide N_s difference values, and the choosing includes choosing the parameter corresponding to a smallest difference value.

8. The method of claim 1, wherein the received signal includes a Gaussian Minimum Shift Keying (GMSK) modulated signal.

9. The method of to claim 1, wherein the receiver includes a Global System Mobile (GSM) receiver.

10. The method according to claim 1, wherein the predetermined sample comprises a training sequence (TS).

11. A method for estimating a parameter associated with a received signal in a wireless receiver, the method comprising:

extracting a vector **r** from the received signal;

establishing a set of hypothetical delays for the received signal based on an estimated position of a known sequence within the received signal;

processing the received signal using on-channel interference reduction processes to provide received signal estimates with one estimate for each of the hypothetical delays, using the vector **r** and the known sequence;

comparing the received signal estimates with the known sequence to generate difference values with one difference value for each of the hypothetical delays; and

choosing the parameter that corresponds to a minimum difference value.

12. The method according to claim 11, further comprises:

decimating the received signal by a factor N_s to generate N_s signal samples associated with the received signal; and wherein

the extracting includes extracting N_s vectors **r**, one of the N_s vectors **r** from each of the N_s signal samples;

the establishing includes establishing the set of hypothetical delays for the each of the N_s signal samples based on the estimated position of the known sequence within the received signal; and

the processing and the comparing are repeated for each of the N_s signal samples to provide N_s difference values, and the choosing includes choosing the parameter corresponding to a smallest difference value.

13. The method of claim 11 wherein:

the extracting a vector **r** further comprises extracting a set of vectors $\mathbf{r}_n$ from the received signal with each one of the set of vectors $\mathbf{r}_n$ corresponding to a different hypothetical delay of the set of hypothetical delays;

the processing the received signal to provide the received signal estimates further comprises determining a corresponding signal estimate for each of the hypothetical delays, using one of the set of vectors $\mathbf{r}_n$ corresponding to the each of the hypothetical delays and the known sequence to provide a set of corresponding signal estimates; and

the comparing the received signal estimate further comprises comparing each the set of corresponding signal estimates to the known sequence to generate a set of difference values.

14. The method of claim 11 wherein

the processing the received signal to provide the received signal estimates further comprises:

extracting a set of portions of the known sequence, one portion corresponding to each of the set of hypothetical delays; and

determining a corresponding signal estimate for each of the set of hypothetical delays, using the vector **r** and a corresponding portion of the set of portions of the known sequence to provide the received signal estimates; and

the comparing the received signal estimates further comprises comparing each of the received signal estimates to the corresponding portion of the set of portions of the known sequence to generate the difference values.

15. The method according to claim 11, wherein the received signal includes a Gaussian Minimum Shift Keying (GMSK) modulated signal.

16. The method according to claim 11, wherein the wireless receiver includes a Global System Mobile (GSM) receiver.

17. The method according to claim 11, wherein the known sequence includes a training sequence (TS).

18. The method according to claim 11, wherein the parameter includes one of a delay parameter corresponding to the received signal and weighting values for an equalization filter.

19. An apparatus for estimating a delay parameter associated with a received signal, the apparatus comprising:

a receiver capable of providing the received signal; and

a processor coupled to the receiver, the processor configured to:

generate a signal sample associated with the received signal;

process the signal sample to suppress on channel interference and provide a processed sample; and

determine the delay parameter by comparing the processed sample to a known sequence.

20. The apparatus of claim 19 wherein the processor is further configured to process the signal sample to suppress the on channel interference using known properties of the received signal.

21. The apparatus of claim 20 wherein the known properties of the received signal include a known quadrature phase relationship for symbols in a portion of the received signal.

22. The apparatus of claim 19 wherein the processor configured to process the signal sample and determine the delay parameter is further configured to:

establish a hypothetical delay for the signal sample based on an estimated delay corresponding to the received signal;

process the received signal to provide a received signal estimate using the hypothetical delay, the signal sample, and the known sequence;

compare the received signal estimate to the known sequence to generate a difference value; and

choose the delay parameter based on the difference value corresponding to the hypothetical delay.

23. The apparatus of claim 22 wherein:

to establish the hypothetical delay for the signal sample further comprises establishing a set of N_d hypothetical delays for the signal sample;

to process the received signal to provide the received signal estimate further comprises:

extracting N_d portions of the signal sample, one portion corresponding to each of the N_d hypothetical delays; and

determining a corresponding signal estimate for each of the N_d hypothetical delays, using the N_d portions and the known sequence to provide N_d corresponding signal estimates;

to compare the received signal estimate further comprises comparing each the N_d corresponding signal estimates to the predetermined sample to generate N_d difference values; and

to choose the delay parameter further comprises choosing the hypothetical delay as the delay parameter for the received signal that corresponds to the smallest difference value.

24. The apparatus of claim 22 wherein

to establish a hypothetical delay for the signal sample further comprises establishing a set of N_d hypothetical delays for the signal sample;

to process the received signal to provide the received signal estimate further comprises:

extracting a portion of the signal sample corresponding to one of the N_d hypothetical delays and N_d portions of the known sequence, one portion corresponding to each of the N_d hypothetical delays; and

determining a corresponding signal estimate for each of the N_d hypothetical delays, using the N_d portions and the portion of the signal sample to provide N_d corresponding signal estimates;

to compare the received signal estimate further comprises comparing each the N_d corresponding signal estimates to the corresponding one of the N_d portions of the known sequence to generate N_d difference values; and

to choose the delay parameter further comprises choosing the hypothetical delay as the delay parameter for the received signal that corresponds to the smallest difference value.

25. The apparatus according to claim 22, wherein:

to generate the signal sample corresponding to the received signal further comprises generating N_s polyphase signal samples associated with the received signal by decimating the received signal by N_s;

to establish the hypothetical delay further includes establishing the hypothetical delay value for each of the N_s polyphase signal samples based on the estimated position of the known sequence within the received signal; and

the process and the compare processes are repeated for each of the N_s polyphase signal samples to provide N_s difference values, and the choosing includes choosing the parameter corresponding to a smallest difference value.

26. The apparatus of claim 19, wherein the received signal includes a Gaussian Minimum Shift Keying (GMSK) modulated signal.

27. The apparatus of claim 19 incorporated in a Global System Mobile (GSM) receiver.

28. The apparatus according to claim 19, wherein the known sequence comprises a training sequence (TS).

29. The apparatus of claim 19 incorporated in a cellular telephone.